

I claim:

1. A radio-frequency transmitting apparatus that can operate concurrently with a television broadcast, comprising:

detector circuitry configured to generate at least one control signal based on a current video signal of the television broadcast to indicate a transmitting timing interval for radio-frequency signal transmission in relation to current timing of the video signal;

an exciter configured to generate a radio-frequency signal separate from the video signal, said radio-frequency signal and television broadcast having sufficient spectral proximity to potentially cause interference;

an antenna coupled with the exciter and configured to receive the radio-frequency signal and to transmit the radio-frequency signal; and

a controller coupled to the control circuitry and coupled to the exciter, said controller configured, in a first operating mode, to enable forwarding of the generated radio-frequency signal to the antenna and, in a second operating mode, to prevent any generated radio-frequency signal from being transmitted by the antenna, wherein the operating mode of the controller is selectable based on the at least one control signal to activate the first operating mode during the transmitting timing interval.

2. The radio-frequency transmitting apparatus according to claim 1, further comprising:

a receiver coupled with the control circuitry and configured to receive the current video signal and forward the received video signal to the detector circuitry.

3. The radio-frequency transmitting apparatus according to claim 2, wherein:

the detector circuitry is further configured to determine at least one of:

a first time interval when the received video signal corresponds to letter-box bars, and

a second time interval when a voltage level of the received video signal is within a specified range; and

wherein the transmitting timing interval substantially coincides with at least one of the first time interval and the second time interval.

4. The radio-frequency transmitting apparatus according to claim 3, wherein the transmitting timing interval substantially coincides with a logical intersection of the first time interval and the second time interval.
5. The radio-frequency transmitting apparatus according to claim 3, wherein the specified range comprises a plurality of different sub-ranges.
6. The radio-frequency transmitting apparatus according to claim 2, further comprising:
a data separator coupled with the receiver and configured to extract data embedded in a predetermined portion of the received video signal, said extracted data identifying the transmitting timing interval.
7. The radio-frequency transmitting apparatus according to claim 6, wherein the at least one control signal comprises a first control signal based on the extracted data.
8. The radio-frequency transmitting apparatus according to claim 6, wherein the predetermined portion of the received video signal corresponds to letter-box bars.
9. The radio-frequency transmitting apparatus according to claim 1, wherein the transmitting apparatus is a cellular base station.
10. The radio-frequency transmitting apparatus according to claim 1, wherein the transmitting apparatus is a mobile cellular station.
11. The radio-frequency transmitting apparatus according to claim 3, wherein the transmitted radio-frequency signal includes an associated priority level and the specified range is based on the associated priority level.

12. The radio-frequency transmitting apparatus according to claim 3, wherein the specified range is based on a geographical location of the transmitting apparatus.

13. A radio-frequency receiving apparatus operating concurrently with a television broadcast, comprising:

detector circuitry configured to generate at least one control signal based on a current video signal of the television broadcast to indicate a reception timing interval for radio-frequency signal reception in relation to current timing of the video signal;

one or more front-end stages configured to generate a radio-frequency signal from a received signal, said received signal being distinct from the video signal, and said received signal and television broadcast having sufficient spectral proximity to potentially cause interference;

a demodulator configured to receive and convert the generated radio-frequency signal into data;

a controller coupled to the detector circuitry and coupled to the front-end stages, said controller configured, in a first operating mode, to enable forwarding of the generated radio-frequency signal to the demodulator and, in a second operating mode, to prevent the generated radio-frequency signal from being forwarded to the demodulator, wherein the operating mode of the controller is selectable based on the at least one control signal to activate the first operating mode during the reception timing interval.

14. The radio-frequency receiving apparatus according to claim 13, further comprising:

a video signal receiver coupled with the detector circuitry and configured to receive the current video signal and forward the received video signal to the detector circuitry.

15. The radio-frequency receiving apparatus according to claim 14, wherein the detector circuitry is further configured to determine at least one of:

a first time interval when the received video signal corresponds to letter-box bars, and

5 a second time interval when a voltage level of the received video signal is within a specified range; and

wherein the reception timing interval substantially coincides with at least one of the first time interval and the second time interval.

16. The radio-frequency receiving apparatus according to claim 15, wherein the reception timing interval substantially coincides with a logical intersection of the first time interval and the second time interval.

17. The radio-frequency receiving apparatus according to claim 15, wherein the specified range comprises a plurality of different sub-ranges.

18. The radio-frequency receiving apparatus according to claim 14; further comprising:

a data separator coupled with the video signal receiver and configured to extract data embedded in a portion of the received video signal.

19. The radio-frequency receiving apparatus according to claim 18, wherein the at least one control signal comprises a first control signal based on the extracted data, said extracted data identifying the reception timing interval.

20. The radio-frequency receiving apparatus according to claim 18, wherein the portion of the received video signal corresponds to letter-box bars.

21. The radio-frequency receiving apparatus according to claim 13, wherein the receiving apparatus is a cellular base station.

22. The radio-frequency receiving apparatus according to claim 13, wherein the receiving apparatus is a mobile cellular station.

23. The radio-frequency receiving apparatus according to claim 13, further comprising:

a radio-frequency receiving antenna configured to receive a signal separate from the video signal and forward the received signal to the front-end stages; and

a front-end controller, coupled to the detector circuitry and coupled between the front-end stages and the radio-frequency receiving antenna, said controller configured, in a third operating mode, to enable forwarding of the received separate signal to the front-end stages and, in a second operating mode, to preventing forwarding of the received separate signal to the front-end stages, wherein the operating mode of the switch is selectable based on the at least one control signal to activate the third operating mode during the reception timing interval.

24. The radio-frequency receiving apparatus according to claim 15, wherein the received radio-frequency signal includes an associated priority level and the specified range is based on the associated priority level.

25. The radio-frequency receiving apparatus according to claim 15, wherein the specified range is based on a geographical location of the receiving apparatus.

26. A system for concurrent use of a portion of the radio-frequency, said system comprising:

a broadcast television transmitter configured to transmit a television signal, said television signal comprising a picture portion and a non-picture portion of a predetermined format; and

a concurrent user apparatus, comprising:

a transceiver configured to transmit and receive respective radio-frequency signals, said signals being distinct from the broadcast television signal, and said signals and said television signal having sufficient spectral proximity to potentially cause interference with reception of the other;

a video signal receiver configured to receive a current video signal of the television signal;

detector circuitry coupled to the video signal receiver and the transceiver and configured to generate at least one control signal based on the received current video signal to indicate an acceptable timing interval for transceiver operation in relation to current timing of the video signal; and

wherein at least one of reception and transmission of respective radio-frequency signals by the transceiver is selectably enabled for operation during the acceptable timing interval according to the at least one control signal.

27. The system according to claim 26, wherein the non-picture portion of the television signal is broadcast at a first power level and the picture portion is broadcast at a second power level, the first power level being less than the second power level.

28. The system according to claim 26, further comprising:

a cable-television headend configured to receive the television signal and to replace the non-picture portion of the received television signal with video signals generated locally at the headend.

29. The system according to claim 26, wherein the non-picture portion comprises at least one letter-box bar.

30. The system according to claim 29, wherein a portion of the at least one letter-box bar is broadcast at an amplitude modulation level less than a conventional amplitude modulation level for standard letter-box bars.

31. The system according to claim 29, wherein a portion of the at least one letter-box bar includes an interference minimizing code.

32. The system according to claim 26, wherein the respective transmitted radio-frequency signals from the transceiver include instruction data transmitted to the broadcast television

transmitter, wherein the instruction data relates to one or more of timing, modulation and power of the television signal.

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33. The system according to claim 26, wherein the respective transmitted radio-frequency signals from the transceiver include instruction data transmitted to a mobile cellular station, wherein the instruction data relates to enabling operation of the mobile cellular station during a predetermined period of the television signal.

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34. A method of operating a radio frequency transmitting apparatus concurrently with a television broadcast, comprising the steps of:

receiving a current video signal of the television broadcast at the transmitting apparatus;

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determining a first set of one or more time intervals in which the received video signal corresponds to a letter-box bar portion of the television broadcast; and

enabling transmission of a radio-frequency signal from the transmitting apparatus only during the first set of one or more time intervals and disabling transmission of the radio-frequency signal from the transmission apparatus otherwise, said radio-frequency signal and said television broadcast having sufficient spectral proximity to potentially cause interference.

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35. The method according to claim 34, further comprising the steps of:

determining a second set of one or more time intervals when a voltage level of the received video signal is within a specified range; and

enabling transmission of the radio-frequency signal from the transmitting apparatus only during periods where the first and second sets of time intervals coincide.

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36. The method according to claim 34, wherein the transmitting apparatus is a cellular base station.

37. The method according to claim 34, wherein the transmitting apparatus is a mobile cellular station.

38. The method according to claim 34, wherein the transmitted radio-frequency signal comprises data intended for at least one of a cellular base station and a mobile cellular station.

39. The method according to claim 35, further comprising the step of:

identifying the specified range based on one of:

a priority level associated with the transmitted radio-frequency signal, and
a geographical location of the transmitting apparatus.

40. A method of operating a radio frequency transmitting apparatus concurrently with a television broadcast, comprising the steps of:

receiving a current video signal of the television broadcast at the transmitting apparatus;

extracting data embedded in a portion of the received video signal;

based on the extracted data, identifying a time interval of the video signal; and

enabling transmission of a radio-frequency signal from the transmitting apparatus only during the identified time interval and disabling transmission of the radio-frequency signal from the transmitting apparatus otherwise, said radio-frequency signal and said television broadcast having sufficient spectral proximity to potentially cause interference.

41. The method according to claim 40, further comprising the steps of:

determining if the received video signal corresponds to a letter-box bar portion or a picture portion of the television broadcast; and

performing the step of extracting data only when the received video signal

corresponds to the letter-box portion.

42. A method of operating a radio frequency receiving apparatus concurrently with a television broadcast, comprising the steps of:

receiving a current video signal of the television broadcast at the receiving apparatus;

5 determining a first set of one or more time intervals when the received video signal corresponds to a letter-box bar portion of the television broadcast; and

enabling reception of a radio-frequency signal at the receiving apparatus during the first set of one or more time intervals and disabling reception of the radio-frequency signal at the receiving apparatus otherwise, said received radio-frequency signal and said television broadcast having sufficient spectral proximity to potentially cause interference.

43. The method according to claim 42, further comprising the steps of:

determining a second set of one or more time intervals when a voltage level of the received video signal is within a specified range; and

5 activating reception of the radio-frequency signal only during time periods when the first and second sets of time intervals coincide.

44. The method according to claim 42, wherein the receiving apparatus is a cellular base station.

45. The method according to claim 42, wherein the receiving apparatus is a mobile cellular station.

46. The method according to claim 42, wherein the received radio-frequency signal comprises data intended for at least one of a cellular base station and a mobile cellular station.

47. The method according to claim 43, further comprising the step of:

identifying the specified range based on one of:

a priority level associated with the received radio-frequency signal, and

a geographical location of the receiving apparatus.

48. A method of operating a radio frequency receiving apparatus concurrently with a television broadcast, comprising the steps of:

receiving a current video signal of the television broadcast at the receiving apparatus;

extracting data embedded in a portion of the received video signal;

based on the extracted data, identifying a time interval of the video signal; and

enabling reception of a radio-frequency signal from the receiving apparatus only during the identified time interval and disabling reception of the radio-frequency signal at the receiving apparatus otherwise, said radio-frequency signal and said television broadcast having sufficient spectral proximity to potentially cause interference.

49. The method according to claim 48, further comprising the steps of:

determining if the received video signal corresponds to a letter-box bar portion or a picture portion of the television broadcast; and

performing the step of extracting data only when the received video signal corresponds to the letter-box portion.

50. A method of operating a radio frequency transceiver apparatus concurrently with a television broadcast, comprising the steps of:

receiving a current video signal of the television broadcast at the transceiver apparatus, said received video signal comprising a picture portion and a non-picture portion, said non-picture portion having a predetermined format;

determining one or more time intervals when the received video signal corresponds to the non-picture portion; and

enabling operation of one or both of a transmitter and receiver of the transceiver only during the one or more time intervals and disabling the operation of one or both of the transmitter and receiver otherwise.

51. The method according to claim 50, wherein the non-picture portion comprises one or more letter-box bar regions.

52. The method according to claim 50, wherein the transceiver apparatus comprises one of a cellular base station and a mobile cellular station.

53. The method according to claim 50, further comprising the steps of:

determining another one or more time intervals when a voltage level of the received video signal is within a specified range;

generating a second control signal, said second control signal having an active state
5 during the another one or more time intervals; and

enabling operation of one or both of the transmitter and the receiver of the transceiver only during time periods when the one or more time intervals and the another one or more time intervals coincide and disabling operation of one or both of the transmitter and the receiver otherwise, wherein, when activated, the transmitter transmits
10 radio-frequency signals and the receiver receives radio-frequency signals, both the transmitted and received radio-frequency signals having sufficient spectral proximity to potentially interfere with the television broadcast.

54. A method of operating a radio frequency transceiver apparatus concurrently with a television broadcast, comprising the steps of:

receiving a current video signal of the television broadcast at the transceiver apparatus;

5 determining one or more time intervals when a voltage level of the received video signal is within a specified range; and

enabling operation of one or both of a transmitter and receiver of the transceiver only during the one or more time intervals and disabling the operation of one or both of the transmitter and receiver otherwise, wherein, when activated, the transmitter transmits
10 radio-frequency signals and the receiver receives radio-frequency signals, both having sufficient spectral proximity to potentially interfere with the television broadcast.

55. A method for a concurrent apparatus and a plurality of television transmitters, each television transmitter transmitting a respective television signal, to concurrently and simultaneously use spectrally proximate portions of the radio-frequency spectrum, said method comprising the steps of:

- 5 broadcasting each of the respective television signals, each of said television signals comprising a non-picture portion and a picture portion;
 - receiving at the concurrent apparatus a current video signal corresponding to one of the respective broadcast television signals;
 - determining one or both of:
 - 10 a first time interval when the received video signal corresponds to the non-picture portion; and
 - a second time interval when a voltage level of the received video signal is within a specified range of voltages;
 - enabling operation of one or both of a transmitter and a receiver of the concurrent
 - 15 apparatus during at least one of the first and second time intervals and disabling operation of one or both of the transmitter and the receiver otherwise, wherein, when activated, the transmitter transmits radio-frequency signals and the receiver receives radio-frequency signals.

56. The method according to claim 55, wherein the step of broadcasting the respective television signals, includes the step of:

- 5 broadcasting the non-picture portion at a first power level and the picture portion at a second power level, the first power level being less than the second power level.

57. The method according to claim 55, wherein the non-picture portion comprises one or more letter-box bar regions.

58. The method according to claim 57, wherein the step of broadcasting the respective television signals, includes the step of:

broadcasting the one or more letter-box regions at an amplitude modulation level less than a conventional amplitude modulation level for standard letter-box bars.

59. The method according to claim 55, further comprising the step of:

synchronizing the broadcasting of two or more of the television signals so that respective non-picture portions are not simultaneously broadcast.

60. The method according to claim 55, further comprising the step of:

synchronizing the broadcasting of two or more of the television signals so that respective non-picture portions are simultaneously broadcast.

61. The method according to claim 55, further comprising the steps of:

receiving one or more of the television signals at a cable-television head end; and replacing any formatted portions of the received television signals with locally generated video signals.

62. The method according to claim 55, further comprising the step of:

synchronizing the broadcasting of two or more of the television signals.

63. The method according to claim 62, wherein the step of synchronizing includes one or more of the following steps:

ensuring a highest luminance portion of each of the two or more television signals are substantially time-coincident; and

preventing one or more of a lowest luminance portion, a most repeated portion, and a continuous portion of each of the two or more television signals from being substantially time-coincident.

64. The system according to claim 57, wherein a portion of the one or more letter-box bar regions include an interference minimizing code.

65. The method according to claim 55, wherein transmitted radio-frequency signals from the concurrent apparatus include instruction data transmitted to one or more of the television transmitters, wherein the instruction data relates to one or more of timing, modulation and power of the respective television signal of the one or more television transmitters.

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66. The method according to claim 55, wherein the transmitted radio-frequency signals from the concurrent apparatus include instruction data transmitted to a mobile cellular station, wherein the instruction data relates to enabling operation of the mobile cellular station during a predetermined period of one or more of the respective television signals.

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